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13.0 Construction Specifications and Estimates

13.1 General

Introduction

The Bridge Projects Unit prepares the specifications and estimates (S&E) for all structural projects designed or reviewed by the Bridge and Structures Office. The preparation includes reviewing the job file, plans, PS&E check list, "Not Included in Bridge Quantities List," foundation report, and preparing the cost estimates, specifications, and working day schedules; and submitting the PS&E package to the Region or Plans Branch.

For projects designed by a Bridge Design Unit, the Bridge Projects Unit normally has three weeks to prepare the S&E package and submit it to the Bridge and Structures Engineer and another week to submit it to the Region or Plans Branch.

For projects designed by a consultant, the Bridge Projects Unit normally has three weeks to review and comment on the 90 percent design package. After the consultant submits the 100 percent design package, the Bridge Projects Unit has three weeks to prepare the S&E package and submit it to the Bridge and Structures Engineer and another week to submit it to the Region or Plans Branch.

13.2 Definitions

A. Standard Specifications

Standard Specifications for Road, Bridge, and Municipal Construction, provisions and requirements for the prescribed work.

B. Amendments

Approved revisions or supplements to specific sections of the standard specifications.

C. Special Provisions

Supplemental specifications and modifications to the standard specifications and the amendments to the standard specifications that apply to an individual project.

D. Addendum

A written or graphic document issued to all bidders and identified as an addendum prior to bid opening, which modifies or supplements the bid documents and becomes a part of the contract.

E. AD Copy

The AD copy is the contract document advertised to prospective bidders.

F. The governing order is as follows: Special Provisions, Contract Plans, then *Standard Specifications for Road, Bridge, and Municipal Construction.*

13.3 Reviewing a Project

A. Job File

Check for the items of work that need to be included in the PS&E; items that need special provisions or cost estimates; and items that require additional research and information. Check that the job file fly leaf information has been completed by the designer (Form 221-076).

B. Bridge Rating Form

Bridge rating forms are prepared by the designer and submitted as part of the design package to the Bridge Projects Unit which are then forwarded to the Bridge Preservation Unit.

C. PS&E Check List (Form 230-037)

Check for special materials, construction requirements, permits, etc., that may need Special Provisions such as:

- Permits: United States Coast Guard
- Agreements: utilities on bridge, etc.
- Materials: structural steel, etc.
- Construction Requirements: temporary access, stage construction, or construction over railroad
- Special Items: modified concrete overlay or architectural treatment

D. Summary of Quantities (Form 230-031)

Verify that the Summary of Quantities is labeled as "Supervisor's Bridge Quantities." That is, the supervisor shall summarize the quantities and resolve all discrepencies between the designer and checker.

E. Plans

Check the plans for materials, special items, stage construction, standard notes and consistent terminology, etc.

F. Not Included in Bridge Quantities (Form 230-038) (see example 13.0 B-3)

Check for items shown on the plans that will be included in region's PS&E work such as items outside the structure limits. These shall be listed on the Not Included in Bridge Quantities List. For example: temporary traffic barrier, gravel backfill for walls, etc.

G. Foundation Report

Check that recommended foundation types and elevations are shown on the plans. Obtain a copy of the final Foundation Report for the S&E file. Check for settlement period of embankment, special excavation, etc., that need special provisions and/or cost estimates. Check for the number of test holes and the locations listed on the layout sheet against the final Foundation Report.

13.4 Preparing the Cost Estimates

A. General

Preparing the Bridge Cost Estimate consists of listing the standard and nonstandard bid items. The software Excel is used to prepare the Cost Estimate. The Bridge Projects Unit uses a standard output format for Cost Estimates. This output includes the tabulation of all items, a breakdown for each lump sum item, and square foot cost of the structure.

B. Procedure

Pricing for the bid items above can be based on the Construction Cost Estimating Aids listed in Appendix A of Chapter 12, bid tabulations from previous contracts, and the Unit Bid Average listing from the Plan Branch Office. The engineer needs to make adjustments for inflation, site location, quantities involved, total of the work involved, etc.

Each standard item has a corresponding code number. Both the item and code number are stored on the Excel worksheet. The nonstandard unit contract items do not have standard item numbers for coding.

All estimates shall include mobilization, but do not include sales tax, engineering, or contingencies.

13.5 Preparing the Specifications

A. General

There are three types of specifications: (1) Standard Specifications and Amendments to the Standard Specifications, (2) General Special Provisions (GSP), and (3) Bridge Special Provisions (BSP).

All of the Amendments, GSP's, and BSP's texts are stored in the computer system and can be retrieved from the Plans Branch Text Processing. The texts are divided into topic documents. Each document is named under a coded name list under the Amendments, GSP, or BSP indexes.

If any modifications are made to a GSP, then the date must be dropped and the document code must be changed.

B. Procedure

In preparation of the bridge specifications, all of the applicable documents of the Amendments, GSPs, and BSPs are each listed in numerical order, and required fill-ins are provided, then these are submitted to text processing. The Plans Branch Text Processing will process the requested list using standard Form 220-013A (Appendix 13.5-A1.)

For special provisions not covered by a GSP or BSP, appropriate documents must be written in the standard format including description, materials, construction requirements, measurement, and payment. These documents are coded and placed on the appropriate order of the listing and are sent to the Plans Branch Text Processing for text processing.

The completed text of the bridge specifications shall be checked for typing errors, contents of the texts, consistent terminology for materials called for in the plans, and pay items called for in the estimates. They shall be revised and reviewed as necessary before the final office copy is printed for the S&E package.

13.6 Preparing the Working Day Schedule

A. General

The Bridge Projects Unit calculates the number of the working days necessary to construct the bridge portion of the contract, and enters the time in the special provision "Time for Completion." The working days are defined in the Section 1-08.5 of the Standard Specifications.

B. Procedure

The first task of estimating the number of working days is to list all the construction activities involved in the project. These include all actual construction activities such as excavation, forming, concrete placement, and curing; and the nonconstruction activities such as mobilization, material and shop plan approval. Special conditions such as staging, limited access near wetlands, limited construction windows for work in rivers and streams, limited working hours due to traffic and noise restrictions, require additional time.

The second task is to assign the number of working days to each construction activity above (see Appendix 13.6-A1). "Construction Time Rate" can be used as a guide to estimate construction time required. This table shows the average rate of output for a single shift, work day only. Adjustment to the rates of this table should be made based on the project size, type of work involved, location of the project, etc. In general, larger project will have higher production rates than smaller projects, new construction will have higher production rates than widening, and unstaged work will have higher production rates than staged work.

The last step is to arrange construction activities, with corresponding working days, into a construction schedule on a bar chart, either by hand on the Construction Working Day Schedule Form 230-041 (see Appendix 13.0 B7) or by computer on the Microsoft Project Program. List the activities in a logical construction sequence, starting from the substructure to the superstructure. Items shall overlap where practical and the critical path shall be identified.

13.7 Reviewing Projects Prepared by Consultants

A. General

Consultants are required to submit the 90 percent complete design package to the Bridge and Structures Office for review and comment three weeks prior to submiting the 100 percent complete design package.

The package shall be in the same format as those prepared by the Bridge and Structures Office.

B. Procedure

The Bridge Projects Unit reviews and comments on the 90 percent complete design package. After the consultant makes corrections and resubmits the package as 100 percent complete, the Bridge Projects Unit prepares and forwards the PS&E package to the Plans Branch.

13.8 Submitting the PS&E Package

A. General

The PS&E package includes:

1. Cover letter to the Bridge and Structures Engineer
2. Cover letter to the Region or Plans Branch.

   For Region Ad and Award projects, the paragraph regarding "As Constructed Plans" and the cc: to "Construction Support Unit Technician" are only used when work related to a bridge is part of the project, not for retaining walls, signs, etc. away from a bridge.
3. Bridge Construction Cost Estimate
4. Not Included in Bridge Quantity List
5. Special Provisions
6. Log of Test Borings
7. One Reduced Xerox Set of Plans
8. Cost Estimate Summary (see Appendix 13.0-B2)
9. Construction Working Day Schedule

B. Procedure

Check with a resident specification and estimate engineer for the latest and most current acceptable distribution list for the region in question.

13.9 Office Copy Review

A. Description

The Office Copy Review is a set of plans and special provisions to be reviewed before the AD Copy is printed. Normally, the Office Copy is received for reviewing two weeks prior to the AD date.

B. Procedure

The review of the Office Copy is to make sure the Bridge PS&E and Log of Test Boring have been properly incorporated before the printing of the AD Copy; and to check the coordination between the region's plans and Bridge Office's plans.

Revisions, changes, additions, deletions shall be submitted to the regions or the Plans Branch by the Specifications and Estimate Engineer.

P:DP/BDM13

Construction Time Rates

Operation	Units**	Minimum Output	Maximum Output	Average Output
Substructure				
Structure Exc. & Shoring	C.Y./Day	20	150	80
*Seals	C.Y./Day	10	20	15
*Footings	C.Y./Day	6	14	10
*Abutment Walls	C.Y./Day	4	19	7
*Wingwalls	C.Y./Day	1	2	1.5
*Retaining Walls with Footings	C.Y./Day	4	17	11
*Columns	C.Y./Day	3	8	4
Falsework for X-beams	C.Y./Day	13	4	10
*X-beams	C.Y./Day	16	20	18
Driving Test Piles	Each/Day	1	2	1
Furnishing Piles				
Precast Concrete	Days	40	20	30
Cast-in-Place Concrete	Days	15	2	5
Steel	Days	30	2	10
Timber	Days	20	2	5
Driving Piles				
Concrete	L.F./Day	100	200	150
Steel	L.F./Day	100	200	150
Timber	L.F./Day	100	200	150
Prestressed Girders				
Girder Fabrication	Days	70	35	45
Set Girders	L.F./Day	200	1,450	550
*Slab & Diaphragms	C.Y./Day	6	18	11
Box Girders				
Span Falsework	S.F./Day	150	900	700
*Bottom Slab	C.Y./Day	3	11	8
*Webs, Diaphragms, and X-beams	C.Y./Day	5	25	18
*Top Slab	C.Y./Day	7	12	9
Stress and Grout Strands	LBS/Day	4,500	8,000	6,000
Strip Falsework	S.F./Day	1,500	3,000	2,200
T-Beam				
Span Falsework	S.F./Day	500	1,000	700
*Girders, Diaphragms, and Slab	C.Y./Day	6	15	10
Strip Falsework	S.F./Day	1,000	2,000	1,500
Flat Slab				
Span Falsework	S.F./Day	100	600	250
*Slab and X-beams	C.Y./Day	6	15	10
Strip Falsework	S.F./Day	300	1,000	500
Steel Girder				
Girder Fabrication	Days	200	110	150
Girder Erection	L.F./Day	50	200	100
*Slab	C.Y./Day	6	15	10
Painting	S.F./Day	1,000	3,000	2,000
Miscellaneous				
*Traffic Barrier	L.F./Day	20	80	40
*Traffic Railing & Sidewalk	L.F./Day	15	60	35
*Concrete Overlay	S.Y./Day	200	300	250
Expansion Joint Replacement	Days/Lane Closure	4	6	8

* Concrete

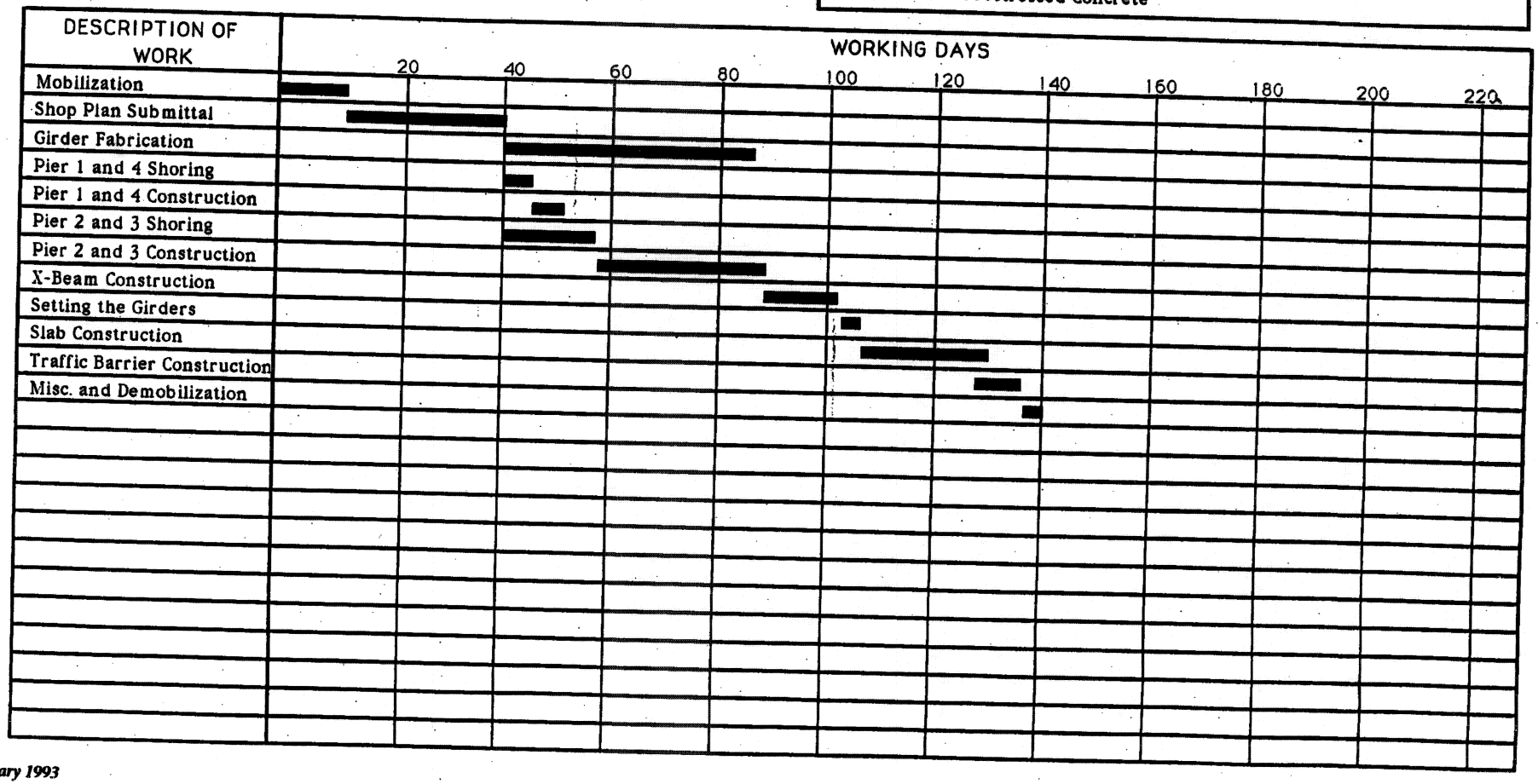
** All times are based on 8-hour work days

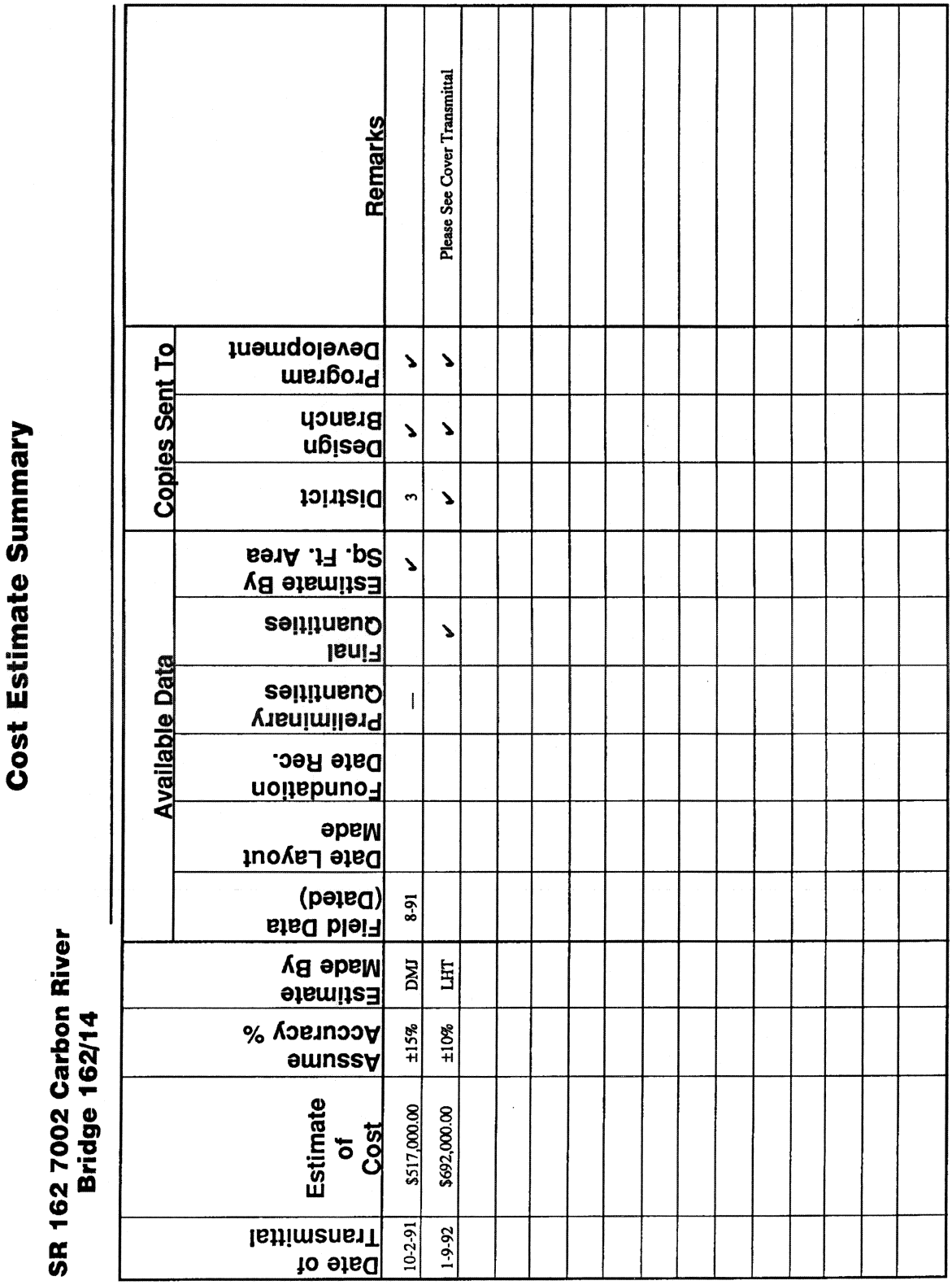
13-6A:P:BDM13

HIGHWAY DIVISION
BRIDGE AND STRUCTURES BRANCH

CONSTRUCTION WORKING DAY SCHEDULE

SR	JOB NO	PROJECT TITLE	
162	L0914	Carbon River Br. No. 162/14	
DESIGN BY	CHECKED BY	DATE	SUPV
LHT		1/10/92	KNK
TYPE OF STRUCTURE	Prestressed Concrete		

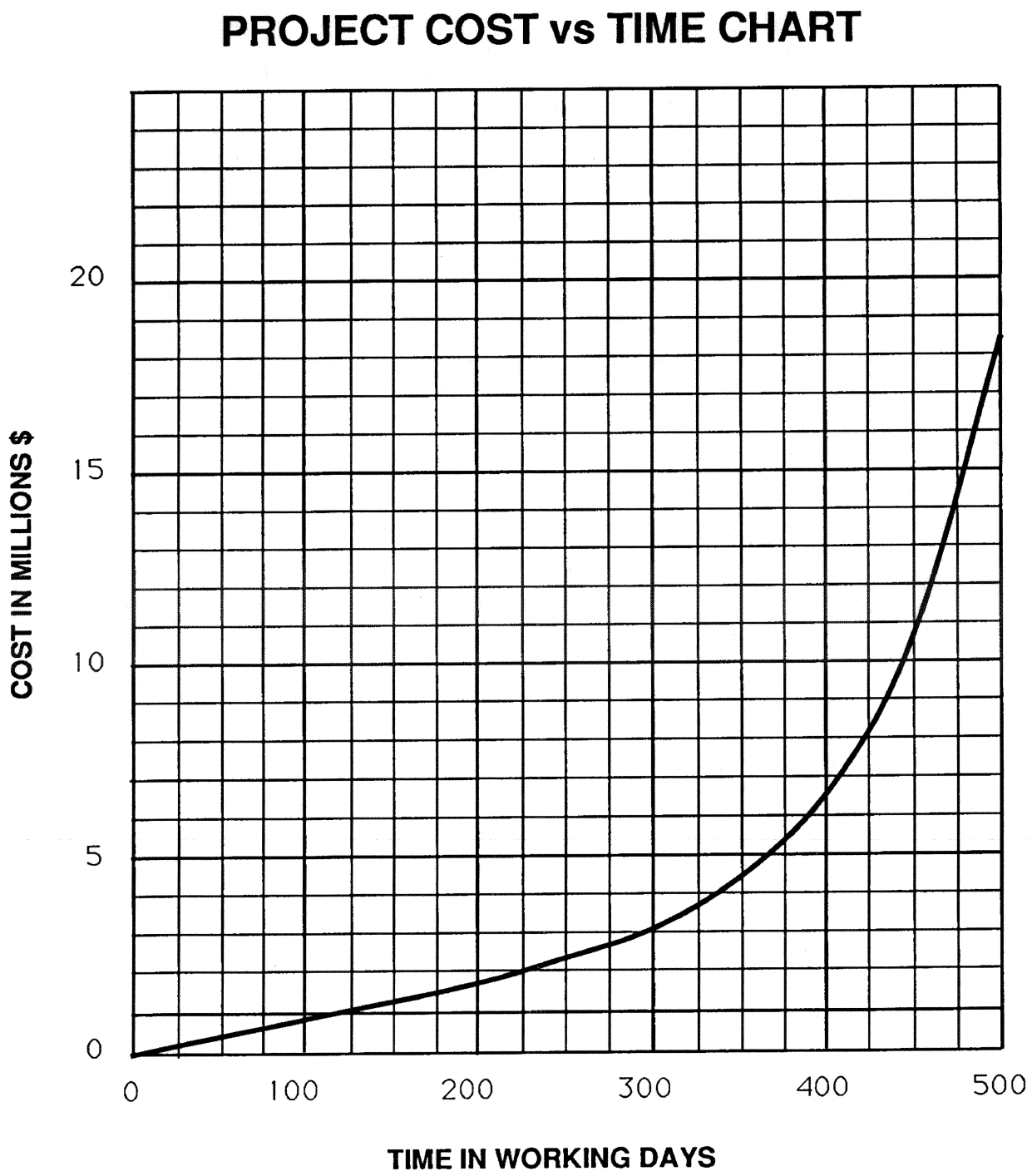




Cost Estimate Summary

SR 162 7002 Carbon River
Bridge 162/14

Date of Transmittal	Estimate of Cost	Assume Accuracy %	Estimate Made By	Available Data: Field Data (Dated)	Available Data: Date Layout Made	Available Data: Foundation Date Rec.	Available Data: Preliminary Quantities	Available Data: Final Quantities	Available Data: Estimate By Sq. Ft. Area	Copies Sent To: District	Copies Sent To: Design Branch	Copies Sent To: Program Development	Remarks
				✓			—		✓	3	✓	✓	
10-2-91	$517,000.00	±15%	DMJ	8-91									
1-9-92	$692,000.00	±10%	LHT					✓		✓	✓	✓	Please See Cover Transmittal


PROJECT COST vs TIME CHART
COST IN MILLIONS $
0
5
10
15
20
0
100
200
300
400
500
TIME IN WORKING DAYS